

Report for the Calumet Refinery Air Monitoring Project



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Table of Contents

| | |
|--|----------|
| PROJECT OVERVIEW | 3 |
| STUDY FOCUS..... | 4 |
| SAMPLING & ANALYTICAL METHODS | 4 |
| MONITORING RESULTS | 4 |
| CONCLUSIONS | 6 |

Project Overview

The project was designed to determine the ambient air concentrations of sulfur compounds in the vicinity of the Calumet Refinery in Shreveport, Caddo Parish (Figure 1). Prior to the start of the project, DEQ had received and investigated numerous odor complaints¹ from citizens living in this area. At the request of local citizens and several public officials, the department installed a fixed monitoring site near the northwest corner of the facility, which is the predominant downwind position. The monitoring effort continued for over a two year period using continuous hydrogen sulfide (H₂S) and continuous sulfur dioxide (SO₂) monitors.

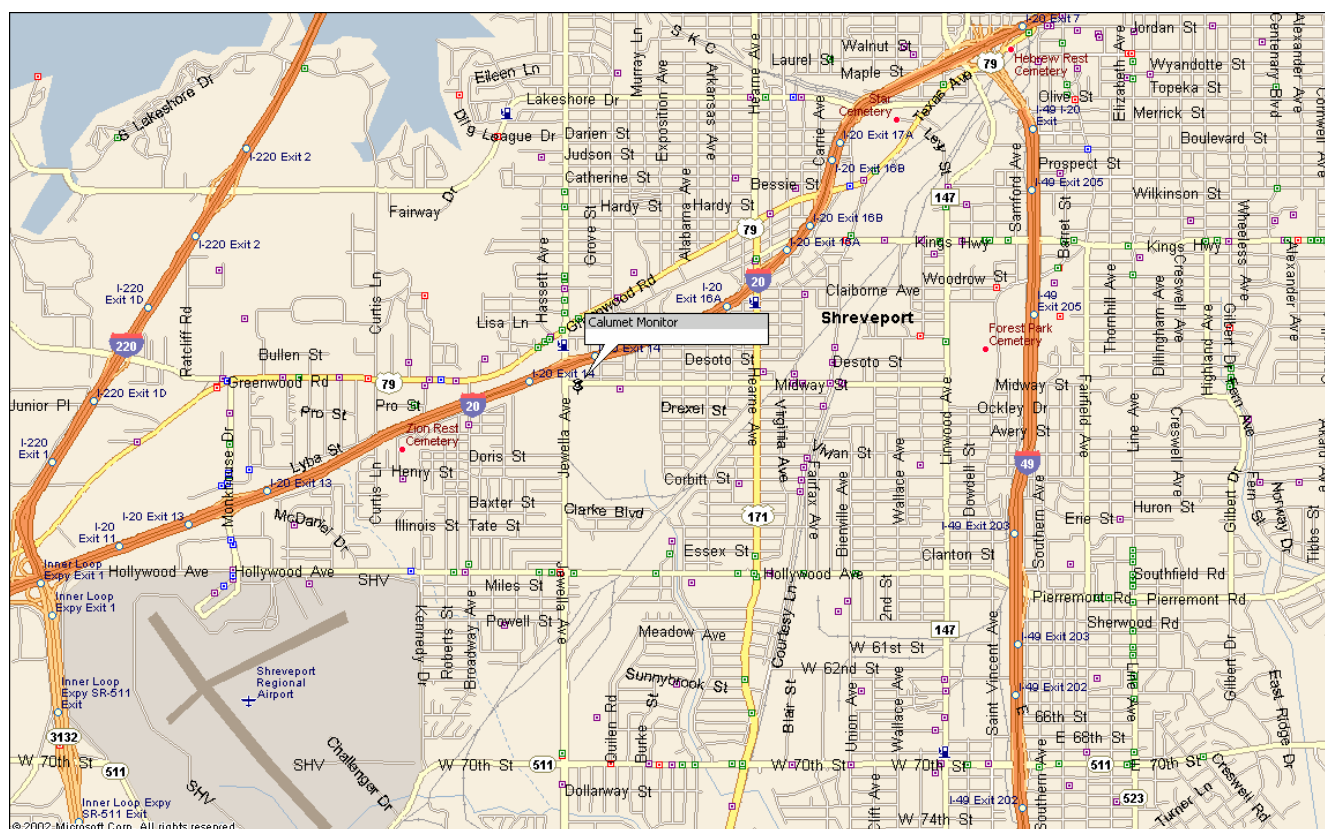


Figure 1: Calumet Site Location

¹ Odors can be caused by a single chemical compound or by combination of many compounds. DEQ investigated odor complaints received from the public; however, the state has no effective standards based on odor. Although research is being conducted nationally on developing techniques to measure odors, current methods are not precise and/or accurate enough to make determinations.

Study Focus

The focus of the study was to:

- Identify the sulfur containing compounds that are most abundantly present in the ambient air near the Calumet Refinery.
- Compare the measured chemical levels, along with appropriate statistical confidence limits, to the applicable ambient air standards established by DEQ and the EPA.

The coordinates for the location of the sampler were 32°28'17" North, 93°47'41" West. This location was chosen for two primary reasons. An examination of a wind rose generated for the greater Shreveport area shows the winds predominantly from southerly & easterly directions. This means emissions from the refinery area should impact a sampler sited on the northwest side of the facility at a much greater frequency than at another sampler location. The security of the site was also an important consideration in order to prevent any unauthorized access to or tampering with the monitoring equipment.

Sampling & Analytical Methods

All monitoring for SO₂ was conducted using the U.S. Environmental Protection Agency's reference method for sulfur dioxide monitoring in ambient air. This method utilizes the fluorescence of sulfur dioxide when subjected to an intense ultraviolet (UV light). While there is no EPA reference method for H₂S, the monitor utilized in this project converts the H₂S present to SO₂ and then uses the SO₂ reference method to measure the concentration of the gas present.

All monitoring data collected was stored on a data logger which recorded the hourly average concentration of each pollutant. Hourly wind speed & direction data was also collected and recorded on the data logger.

Monitoring Results

Over 21,000 hours of valid data was collected following the project start on October 31, 2002 and the conclusion of data collection on April 21, 2005. A summary of the hourly data appears in the table below. The vast majority of the readings obtained were very close to or just above the 1 ppbv detection limit of the instrument.

| | Hourly Average | Hourly Max | Hourly Median |
|------------------|----------------|---------------|---------------|
| Sulfur Dioxide | 2.95 | 171.80 | 2.4 |
| Hydrogen Sulfide | 2.56 | 50.16 | 1.92 |

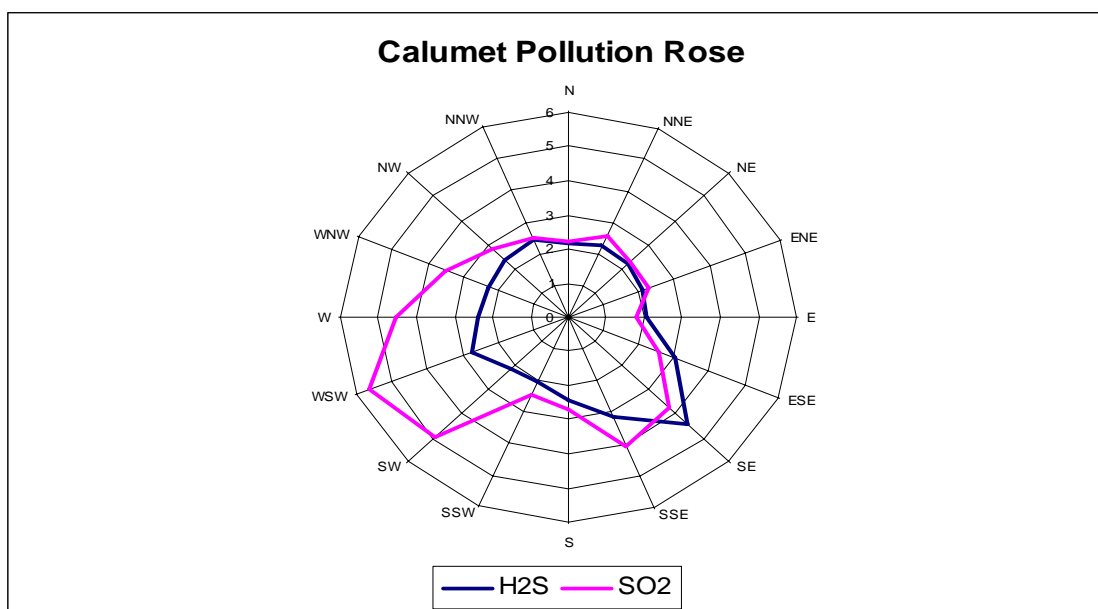
The EPA Primary National Ambient Air Quality Standard (NAAQS) for sulfur dioxide is an annual average concentration of 30 ppbv. As seen in the table above, the average concentration of SO₂ measured at the site was less than 1/10 of the annual NAAQS. EPA also has a 24-hour standard for SO₂ which is 140 ppb and a secondary standard of 500 ppb for a 3-hour averaging period. The table below shows the maximum 24-hour SO₂ reading observed was 43 ppb which is less than 1/3 of the NAAQS standard. The table also shows the maximum 3-hour SO₂ reading observed is 150 ppb which is also less than 1/3 of the secondary NAAQS standard.

| | 24-Hour SO₂ | 3-Hour SO₂ |
|---------|-------------------------------|------------------------------|
| Maximum | 43.01 | 150.80 |
| Median | 2.66 | 2.45 |

There is no NAAQS standard for hydrogen sulfide. However, Louisiana has established an 8-hour ambient air standard of 330 ug/m³ (237ppb) for hydrogen sulfide. None of the 8-hour average concentrations measured for hydrogen sulfide were above the annual average Louisiana Ambient Air Standard. The highest 8-hour concentration observed was less than 1/8 of the Louisiana standard.

| | Average | Maximum |
|-------------------------|---------|---------|
| Hourly Hydrogen sulfide | 2.56 | 50.16 |
| 8-Hour Hydrogen sulfide | 2.56 | 27.22 |

The pollution rose presented on the next page shows that the concentration of both sulfur dioxide and hydrogen sulfide tend to be higher when the wind is from the southeast or from the direction of the refinery. While this is expected, the graph also indicates there is another significant SO₂ source to the west of the monitoring station.



Conclusions

During the course of the study none of the average concentrations measured exceeded the Louisiana Ambient Air Standards, nor did they exceed any EPA NAAQS standard. All of the averages combined with the 95% confidence intervals are well below the standards and do not appear to represent a health risk to the residents living nearby.

The time series plot for hydrogen sulfide below shows the vast majority of the readings recorded were below 10 ppbv which is the noticeable odor threshold.

